JAPAN

EDICT OF GOVERNMENT

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JIS B 9709-1 (2001) (English): Safety of machinery -- Reduction of risks to health from hazardous substances emitted by machinery -- Part 1: Principles and specifications for machinery manufacturers

ISO INSIDE

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The citizens of a nation must honor the laws of the land.

Fukuzawa Yukichi

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JIS

JAPANESE
INDUSTRIAL
STANDARD

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JIS B 9709-1 : 2001

(ISO 14123-1 : 1998)

Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery — Part 1: Principles and specifications for machinery manufacturers

ICS 13.110 ; 13.300

Descriptors : equipment safety, occupational safety, toxic materials, safety education

Reference number : JIS B 9709-1 : 2001 (E)

Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law:

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Technical Committee on Industrial Machine

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In the event of any doubts arising as to the contents, the original JIS is to be the final authority.

Contents

JIS B 9709-1 : 2001
(ISO 14123-1 : 1998)

Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery — Part 1: Principles and specifications for machinery manufacturers

Introduction This Japanese Industrial Standard has been prepared based on the first edition of **ISO 14123-1** *Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery — Part 1: Principles and specifications for machinery manufacturers* published in 1998 with modifying the technical contents.

The foreword of the original International Standard has been excluded because it is not part of the provisions.

1 Scope This part of **JIS B 9709** deals with principles for the control of risks to health due to hazardous substances from machinery. This part of **JIS B 9709** is not applicable to substances which are a hazard to health solely because of their explosive, flammable or radioactive properties or their behaviour at extremes of temperature or pressure.

NOTE : The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

ISO 14123-1 : 1998 *Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery — Part 1: Principles and specifications for machinery manufacturers* (IDT)

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. If the indication of the year of coming into effect or the year of publication is given to these referred standards, only the edition of the indicated year constitutes the provision of this Standard but the revision and amendment made thereafter do not apply. The normative references without the indication of the year of coming into effect or the year of publication apply only to the most recent edition (including amendments).

JIS B 9702 : 2000 *Safety of machinery — Principles of risk assessment*

NOTE : **ISO 14121**:1998 *Safety of machinery — Principles of risk assessment* is identical with the said standard.

JIS B 9709-2 : 2001 *Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery — Part 2: Methodology leading to verification procedures*

NOTE : **ISO 14123-2**:1998 *Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery — Part 2: Methodology leading to verification procedures* is identical with the said standard.

ISO/DIS 12100-1 *Safety of machinery — Basic concepts and general principles for design — Part 1: Basic terminology, methodology*

3 Definitions For the purposes of this part of **JIS B 9709**, the following definitions apply:

3.1 intended use Use of a machine in accordance with the information provided in the instructions for use (see **ISO/DIS 12100-1**)

3.2 hazardous substance Any chemical or biological agent which is hazardous to health, e.g. substances or preparations classifies as

- very toxic;
- toxic;
- harmful;
- corrosive;
- irritant;
- sensitizing;
- carcinogenic;
- mutagenic;
- teratogenic;
- pathogenic:
- asphyxiant.

4 Risk assessment

4.1 An identification of hazards and assessment of the foreseeable risks from substances hazardous to health shall be made by the machinery manufacturer. This shall cover, as far as possible, any potential danger arising from exposure of persons to the machine at any stage in tis life.

NOTE : Details of the methodology of risk assessment are given in **JIS B 9702** : 2000.

4.2 The level of risk depends on the hazardous properties of the substances, the likelihood that personal exposure will occur and the degree of exposure. The health effects of hazardous substances may be:

- short or long term;
- reversible or irreversible.

4.3 Hazardous substances can be in any physical state (gas, liquid, solid) and can affect the body by:

- inhalation;
- ingestion;
- contact with the skin, eyes and mucous membranes;

– penetration through the skin.

4.4 The hazardous substances may be generated from:

– any part of a machine;

– substances present in the machine;

– material arising directly or indirectly from articles and/or substances processed by the machine or used on the machine.

4.5 The stages in the life of a machine may include (see also **ISO/DIS 12100-1**):

– construction;

– transport and commissioning;

– transport;

– installation;

– commissioning;

– use;

– operation, including start-up and shut-down;

– failure;

– setting or process changeover;

– cleaning;

– adjustment;

– maintenance and repair;

– decommissioning, dismantling and, as far as safety is concerned, disposal.

5 Types of emissions

5.1 Airborne emissions

5.1.1 Airborne emissions can represent significant sources of exposure to hazardous substances. Inhalation is usually the most significant of all the routes of entry (see **4.3**). In addition, airborne emissions may enter the body by other routes, particularly when substances are deposited on a body surface or when they are ingested.

5.1.2 Airborne emissions may arise from various sources, including:

– machining, e.g. sawing, grinding, sanding, milling;

– evaporation and thermal convection, e.g. open tanks, crucibles, solvent baths;

– hot-metal processes, e.g. welding, brazing, soldering, profile-cutting, casting;

– material handling, e.g. hopper-charging, pneumatic conveying, sack-filling;

– spraying, e.g. painting, high-pressure cleaning;

– leaks, e.g. at pump seals, flanges;

– byproducts and effluents, e.g. gases from drosses, rubber vulcanization fumes;

– maintenance, e.g. emptying filter bags;

- dismantling processes, e.g. breaking of lead batteries, stripping of asbestos insulation;
- combustion of fuel, e.g. internal combustion engine exhausts;
- apparatus for mixing food;
- metalworking, e.g. nitrosamines from water-soluble metalworking lubricants.

5.1.3 Some examples of airborne hazardous substances are as follows:

- respiratory irritants, e.g. sulfur dioxide, chlorine, cadmium fumes;
- sensitizers, e.g. isocyanates, enzymes, colophon fumes;
- carcinogens, e.g. asbestos, chromium (VI), benzene, vinyl chloride monomer;
- fibrogenic dusts, e.g. free crystalline silica, asbestos, cobalt;
- asphyxiants, e.g. nitrogen, argon, methane;
- biological agents, e.g. Legionella pneumophila, dust from mouldy hay;
- substances which affect specific parts of the body, e.g. mercury (nerve system, kidneys): lead (nerve system, blood); carbon tetrachloride (nerve system, liver); carbon monoxide (blood).

5.1.4 Airborne emissions may be subject to techniques of evaluation based on the measurement of concentrations of substances in the breathing zone of the persons involved. The results of such measurements are usually compared with suitable criteria.

5.1.5 There are many methods of sampling air and analysing the sample for airborne contaminants. Sampling methods and analytical techniques should be selected according to the nature of the airborne contaminant.

5.2 Non-airborne emissions

5.2.1 Non-airborne emissions can be significant sources of exposure to hazardous substances by ingestion, contact with skin, eyes or mucous membranes or penetration through the skin (see **4.3**).

5.2.2 Non-airborne emissions may be produced in various circumstances, including:

- migration from open sources, e.g. splashing and evaporation/condensation leading to secondary emissions;
- opening machinery, e.g. for maintenance;
- entry into machinery, e.g. for inspection;
- material handling, e.g. charging, sampling, disposal;
- handling machinery parts, e.g. dismantling;
- incorrect operation, e.g. overfilling;
- leaks, e.g. at pump seals, flanges;
- ruptures.

5.2.3 Exposure to non-airborne emissions can cause ill health as a result of a variety of hazardous properties associated with different materials. Same examples of these materials include:

- corrosives, e.g. sulfuric acid;
- irritants, e.g. wet cement;
- sensitizers, e.g. chromium compounds, epoxy resins;
- carcinogens, e.g. used quenching oil, beryllium oxide, polycyclic aromatic hydrocarbons;
- biological agents, e.g. infected cutting oils, infected blood.

The ill health produced may be local at the point of contact or the result of effects elsewhere in the body (systemic or target organ). With some materials, both situations may occur, e.g. phenol.

5.2.4 Non-airborne emissions cannot be evaluated by measurements of concentration of substances in the air. Criteria based on these concentration cannot be used. Other criteria may be established, e.g. limits regarding microbial concentrations in cutting oils.

5.2.5 In some cases it can be relevant to carry out quantitative assessments of surface contamination. The criteria to be applied should be based on both toxicological and practical considerations. Techniques for measuring such contamination include:

- chemical analyses of wipes;
- use of fluorescent tracers;
- colorimetric indications;
- count of microorganisms.

6 Requirements and/or measures for elimination and/or reduction of risk

Risks of exposure to hazardous substances shall be reduced as far as practical, taking into account scientific and technical methods and limits relating to exposure and the external environment. In selecting the most appropriate methods of reducing risks, the manufacturer shall take measures to reduce the risks of exposure as close to the emission source as possible. The manufacturer shall apply the following principles, in the order given, taking into account the state of the art:

- design of machinery to eliminate or prevent risks of exposure;
- design of machinery to reduce risks that cannot be eliminated, in the following order of priority:
  1) reduction of emission;
  2) reduction by ventilation or other engineering means;
  3) reduction of exposure by machinery operation or segregation.
- information about the residual risks to the user and advice to the user on additional measures to reduce exposure.

NOTE : A detailed list of possible measures is given in annex A.

7 Information for use and maintenance

7.1 Information for use

7.1.1 The manufacturer shall state in the instructions the intended uses of the machine, the hazardous substances which can arise from the machine (see **4.4**) and the operating procedures. The manufacturer shall specify, when necessary, the level of competence to be achieved by training. The manufacturer shall give appropriate details in the instructions where setting and operating conditions of the machine can result in a reduction of risks.

7.1.2 When the machine is equipped with means of reducing the risks to health, the machinery manufacturer shall supply information on its correct use and factors that may adversely affect its performance.

7.1.3 When there is no such provision of means of reducing the risk to health, such methods of reduction and/or testing which are suitable and proven shall be specified by the manufacturer.

7.1.4 If leaks, spills or uncontrolled releases of a hazardous substance can be foreseen, the manufacturer shall provide information to limit the extent of risks to health and to regain adequate control as soon as possible. The information should cover, where appropriate, emergency procedures, safe disposal of the substance and suitable protective equipment to enable the source of release to be safely identified and repairs to be made.

7.1.5 The manufacture shall provide information on the necessary personal protective equipment and hygiene arrangements.

7.2 Information for maintenance The machinery manufacturer shall provide sufficient instructions for the maintenance of the machine without risk to health.

NOTE : This may include the necessary maintenance to ensure the continuing effective reduction of emissions of hazardous substances. Implementation by the user may be achieved by a structured maintenance programme employing various functional and performance checks at suitable intervals as far as applicable.

EXAMPLE : The elements of such a maintenance programme for the user of a mechanical vibrating screen may include regular checks on:

- the physical condition of the hardware, including screen covers, inspection hatches, etc. required to maintain the integrity of containment;
- gaskets and seals associated with covers and hatches, to ensure that they are intact and functional;
- flexible connectors on feed and product lines, to ensure that they are still connected and in good condition;
- extraction ventilation, including visual checks, routine mechanical inspection and ventilation performance testing;
- the accumulation of material.

8 Verification of safety requirements and/or measures Methodology leading to verification procedures for the reduction of risks to health from hazardous substances emitted by machinery is described in **JIS B 9709-2**:2001.

Annex A (informative) Examples of measures for reduction of exposure to hazardous substances

NOTE : These examples may either be incorporated into the machinery design or provided as information for the user.

A.1 Elimination and prevention of risks Examples of measures for elimination and prevention of risks are listed below:

- elimination of the operation that causes the emission;
- selection of an alternative production process;
- selection of alternative operations;
- elimination of the use of the substance;
- substitution of hazardous materials by less hazardous alternatives, e.g. cadmium-free silver solder;
- use of totally enclosed processes and handling systems, e.g. enclosed pumps;
- use or remote controlled and automated processes.

A.2 Reduction of risks

A.2.1 Reduction of emission Examples of measures for reduction of emission are listed below:

- use of vapour-return systems, e.g. piping of displaced air to supply tank;
- use of dust-reduced forms, e.g. pellets, granules, flakes or pastilles instead of powders;
- enclosed materials-handling systems;
- dust suppression by wetting;
- maintenance of valves, pumps and flanges;
- prevention of spills and leaks;
- use of liquids which are dust-free when dried out, e.g. use of an anti-stick soap solution on unvulcanized rubber;
- immersion of shafts and seals of reactive liquids to absorb leaks of hazardous substances, e.g. isocyanate pumps;
- fitting covers, flexible or rigid barriers or floating balls to contain emissions from e.g. conveyors, tanks;
- condensation of vapours, e.g. insolvent-degreasing tanks;
- operation of systems under negative pressure;
- process control, e.g. use of thermostats, pressure switches.

A.2.2 Reduction by ventilation Examples of measures for reduction of risks by use of ventilation are listed below. In most cases the descending order of effectiveness is:

- local exhaust ventilation from almost complete to partial enclosure;
- local exhaust ventilation without enclosure;
- air curtains;
- general dilution ventilation, e.g. extraction with clean-air inflow;
- ventilation by building design, e.g. hot processes in high buildings.

A.2.3 Reduction of exposure by management or segregation Examples of measures for reduction of exposures by management or segregation are listed below:

- prohibition of non-essential access, e.g. to confined spaces or dangerous operations or high-risk areas;
- separation of hazardous and non-hazardous operations, e.g. by partial enclosures, partitions or separate buildings;
- reduction of the number of employees exposed to hazards, e.g. by multiskill training or more efficient work practices;
- operation of processes from control rooms with visits to polluted areas only when needed;
- use of bund walls to prevent spread of spillage;
- reduction of exposure time.

A.3 Information and other measures regarding residual risks Examples of information to be provided or measures to be taken regarding residual risks are listed below:

- regular cleaning or disinfection of contaminated walls, surfaces, etc.;
- provision of means for safe storage and disposal of substances hazardous to health;
- suitable personal protective equipment;
- prohibition of eating, drinking and smoking in contaminated areas;
- provision and maintenance of adequate facilities for washing, changing and storage of clothing, including suitable arrangements for laundering contaminated clothing;
- adequate information, instruction and training for appropriate personnel.

Errata for JIS (English edition) are printed in *Standardization Journal*, published monthly by the Japanese Standards Association, and also provided to subscribers of JIS (English edition) in *Monthly Information*.

Errata will be provided upon request, please contact:

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